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U.S. Army Toxic and Hazardous Materials Agency

Enhanced Preliminary Assessment Report:

Swansea Army Housing Units Swansea, Massachusetts

September 1989

prepared for

Commander
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010-5401

prepared by

Environmental Research Division
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Argonne, Illinois 60439

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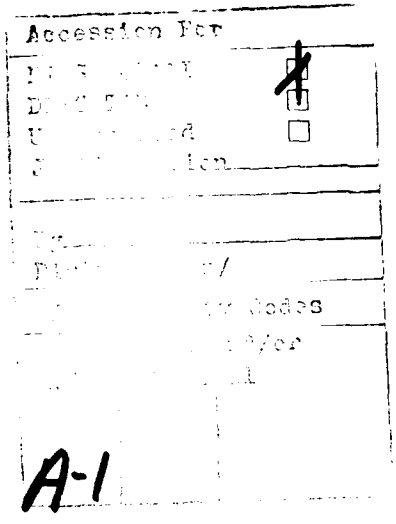

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Argonne National Laboratory has conducted an enhanced preliminary assessment of the Army housing property located in Swansea, MA. The objectives of this assessment include identifying and characterizing all environmentally significant operations, identifying areas of environmental contamination that may require immediate remedial actions, identifying other actions which may be necessary to resolve all identified environmental problems, and identifying other environmental concerns that may present impedients to the expeditious sale of this perperty.

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SUMMARY

The Swansea housing facility located in Swansea, Mass., presents no imminent or substantial threat to human health or the environment. There is no evidence to suggest that hazardous or toxic constituents have ever been released from this property. No immediate remedial actions, therefore, are warranted for the site. Nevertheless, two environmental impacts at this property have been identified, and these warrant some ultimate remedial action.

Although these housing units were originally developed in support of a Nike missile battery, all available documentation and circumstantial evidence suggest that the housing property was wholly independent of the battery's operational activities. No Nike-related wastes were delivered to this property for management or disposal. Furthermore, since this property was independent of the Nike missile operations with respect to all necessary utilities, there is no possibility of migration of Nike-related wastes along buried utility lines.

A concern involves the underground heating-oil tanks at each housing unit on the property. Although there is no documentation reporting a failure or suspected leak in any of these tanks, real property records indicate they are more than 30 years old and there is no record of them being covered with cathodic protection or protective coatings when they were installed. Circumstantially, then, each of these tanks may be at or near the end of its effective use. Since no deliberate attempt has been made to characterize the integrity of any of these tanks, their continued use makes the possibility of an environmental release real but the likelihood of this happening unknown. Furthermore, the often saturated condition of the soils at this property can be expected to have aided corrosion of the tanks and associated plumbing.

An additional concern is the malfunctioning sewage-treatment system at Swansea. The system represents a continuing potential for environmental impact and an impediment to the expeditious excessing of this property.

The following actions are recommended prior to release of this property:

- Develop and implement a permanent solution to the sewage-treatment problems.

- Remove and replace underground heating-oil tanks at all units on the property, sampling soils in all portions of the tank excavations to identify any possible areas of contamination.

The recommendations assume that the property will most likely continue to be used for residential housing.

1 INTRODUCTION

In October 1988, Congress passed the Defense Authorization Amendments and Base Closure and Realignment Act, Public Law 100-526. This legislation provided the framework for making decisions about military base closures and realignments. The overall objective of the legislation is to close and realign bases so as to maximize savings without impairing the Army's overall military mission. In December 1988, the Defense Secretary's ad hoc Commission on Base Realignment and Closure issued its final report nominating candidate installations. The Commission's recommendations, subsequently approved by Congress, affect 111 Army installations, of which 81 are to be closed. Among the affected installations are 53 military housing areas, including the Swansea housing area addressed in this preliminary assessment.[1]

Legislative directives require that all base closures and realignments be performed in accordance with applicable provisions of the National Environmental Policy Act (NEPA). As a result, NEPA documentation is being prepared for all properties scheduled to be closed or realigned. The newly formed Base Closure Division of the U.S. Army Toxic and Hazardous Materials Agency is responsible for supervising the preliminary assessment effort for all affected properties. These USATHAMA assessments will subsequently be incorporated into the NEPA documentation being prepared for the properties.

This document is a report of the enhanced preliminary assessment (PA) conducted by Argonne National Laboratory (ANL) at the Army stand-alone housing area in Swansea, Mass.

1.1 AUTHORITY FOR THE PA

The USATHAMA has engaged ANL to support the Base Closure Program by assessing the environmental quality of the installations proposed for closure or realignment. Preliminary assessments are being conducted under the authority of the Defense Department's Installation Restoration Program (IRP); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 91-510, also known as Superfund; the Superfund Amendments and Reauthorization Act of 1986, Public Law 99-499; and the Defense Authorization Amendments and Base Closure and Realignment Act of 1988, Public Law 100-526.

In conducting preliminary assessments, ANL has followed the methodologies and procedures outlined in Phase I of the IRP. Consequently, this PA addresses all documented or suspected incidents of actual or potential release of hazardous or toxic constituents to the environment.

In addition, this PA is "enhanced" to cover topics not normally addressed in a Phase I preliminary assessment. Specifically, this assessment considers and evaluates the following topical areas and issues:

- Status with respect to regulatory compliance,
- Asbestos,
- Polychlorinated biphenyls (PCBs),
- Radon hazards (to be assessed and reported on independently),
- Underground storage tanks,
- Current or potential restraints on facility utilization,
- Environmental issues requiring resolution,
- Health-risk perspectives associated with continued residential land use, and
- Other environmental concerns that might present impediments to the expeditious "excessing," or transfer and/or release, of federally owned property.

1.2 OBJECTIVES

This enhanced PA is based on existing information from Army housing records of initial property acquisition, initial construction, and major renovations and remodeling performed by local contractors or by the Army Corps of Engineers. The PA effort does not include the generation of new data. The objectives of the PA include:

- Identifying and characterizing all environmentally significant operations (ESOs),
- Identifying property areas or ESOs that may require a site investigation,
- Identifying ESOs or areas of environmental contamination that may require immediate remedial action,
- Identifying other actions that may be necessary to address and resolve all identified environmental problems, and
- Identifying other environmental concerns that may present impediments to the expeditious transfer of this property.

1.3 PROCEDURES

The PA began with a review of Army Housing records located at Fort Devens, Mass., approximately 35 miles northwest of Boston, the week of May 15-19, 1989. Additional information was obtained from the Army Corps of Engineers District Office in Waltham, Mass., on May 17 and from conversations with personnel from the office of the Area Engineer, Fort Devens, on May 18. A site visit was conducted at Swansea, Mass., on May 18, 1989, at which time additional information was obtained through personal observations of ANL investigators. ANL investigators revisited the property on Sept. 9, 1989, at which time the interiors of the houses were visually inspected for the presence and condition of asbestos-containing materials. Photographs were taken of the housing units and surrounding properties as a means of documenting the condition of the housing units and immediate land uses. Site photographs are appended.

All available information was evaluated with respect to actual or potential releases to air, soil, and surface and ground waters.

2 PROPERTY CHARACTERIZATION

2.1 GENERAL PROPERTY INFORMATION

The Swansea housing units are located in southeastern Massachusetts, in the town of Swansea, county of Bristol. The entire property consists of 4.79 acres. The town of Swansea had an estimated population in 1984 of 15,000.[2] Figures 1 and 2 show the general location of the facility.[3]

The housing units were developed in 1958.[4] No additional major construction has taken place on the property since that time. The Army Corps of Engineers Office for the southeast Boston area, located in Brockton, Mass., is responsible for major renovations or upgrading within the facility.

2.2 DESCRIPTION OF FACILITY

Figure 3 presents the site plan of the housing property.

Housing Units

The Swansea housing area consists of 16 "capehart" style houses, each having three bedrooms and one family unit, with carport and storage room. "Capehart" is the model name assigned to these houses by the builder, National Homes. These woodframe houses are built on concrete slabs.[4] Water lines and air conditioning ducts are imbedded in the foundation slab.

Utilities

Since development of the property, the housing units have been supplied with city water; no drinking water wells exist on the property, and locations of nearby municipal or private drinking water wells are not known. The property also receives electricity from the city, and all telephone poles and transformers on site are the responsibility of Swansea's power company.

Sewage

Each housing unit has a septic tank located in its backyard. These septic tanks are connected to a common leaching field located in the approximate center of the property. No records on the septic system were found, but reportedly it is more than 30 years old.[5] System malfunctions indicate that the sewage system is exhausted and has contributed to the many problems associated with the property's poorly drained land and surrounding swampland. Individual septic tanks are reported to have backed up. Two tanks in particular, those associated with housing units #4 and #9, have been pumped out numerous times to attain limited use.[5] Septic tank pumpings were disposed off-site by a

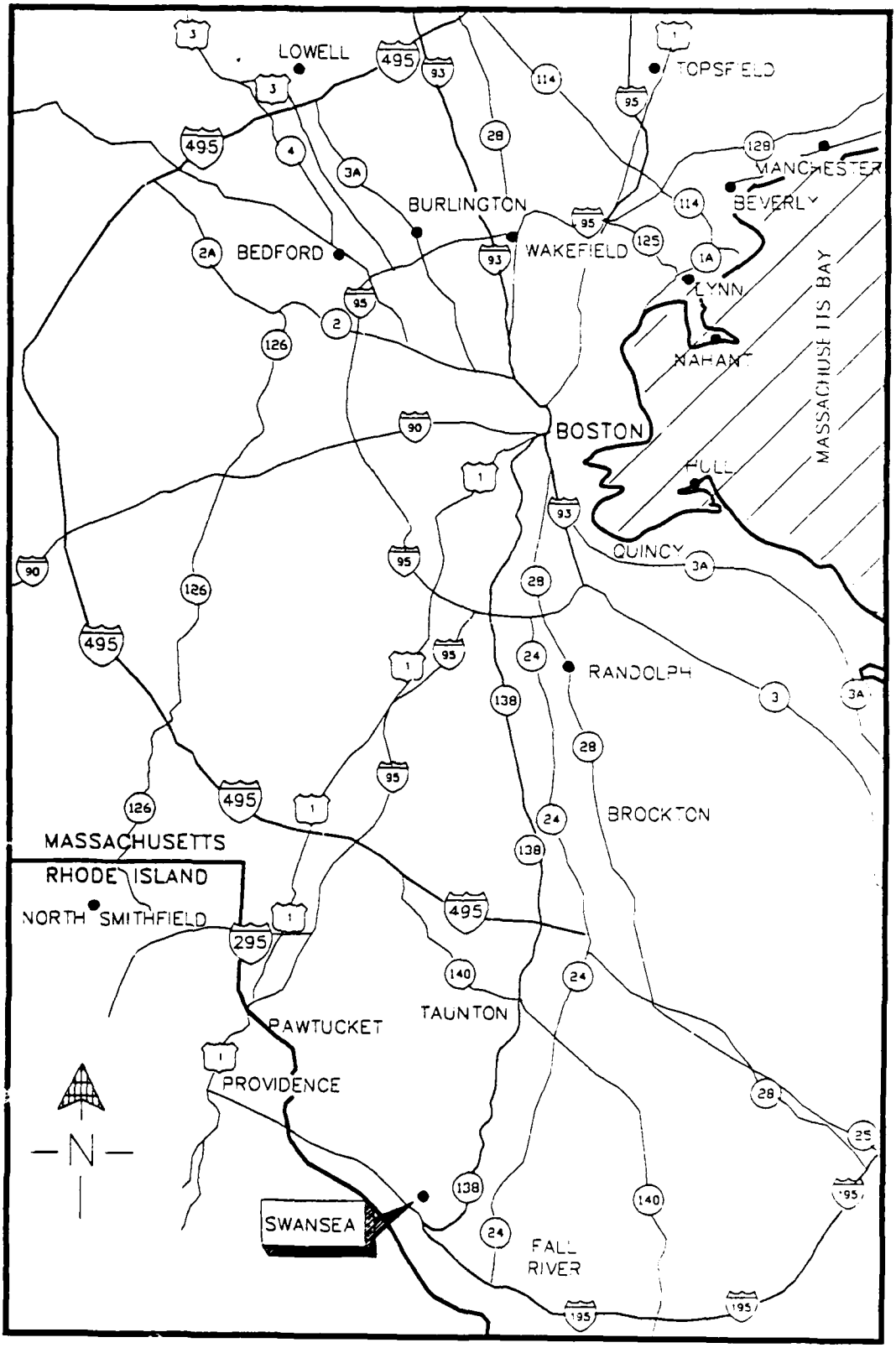

FIGURE 1 Location Map of Massachusetts Army Housing Facilities

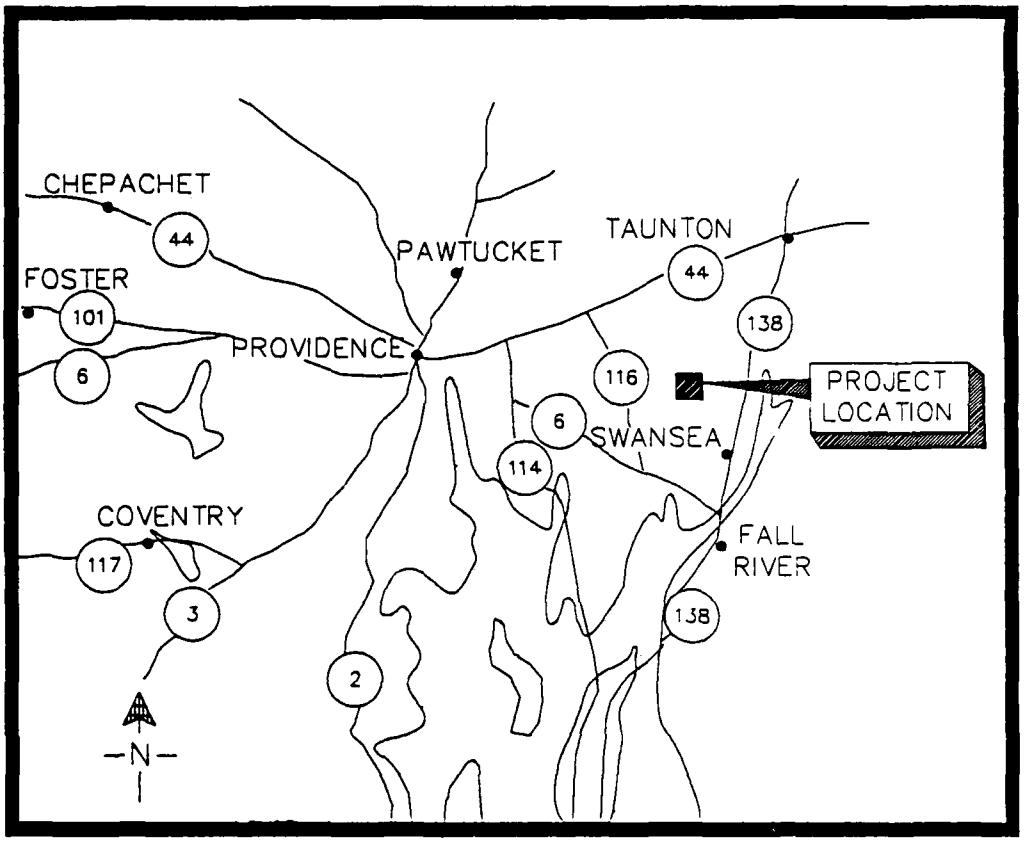

FIGURE 2 Vicinity Map of Swansea Army Housing Units

local contractor. Raw sewage has entered the individual houses and caused a potential health hazard.[6] This continuing problem is discussed in more detail in Sec. 3.

Fuel Storage

Each unit has an underground storage tank (UST) that holds 275 gallons of heating oil.[4] The USTs are located at the front of each housing unit. All tanks are original, installed during initial housing construction in 1958.[4]

Storm Drainage Systems

The property is drained by open ditches or surface run-off through a culvert, across Sharps Lot Road.

Other Permanent Structures or Property Improvements

No such structures or improvements exist.

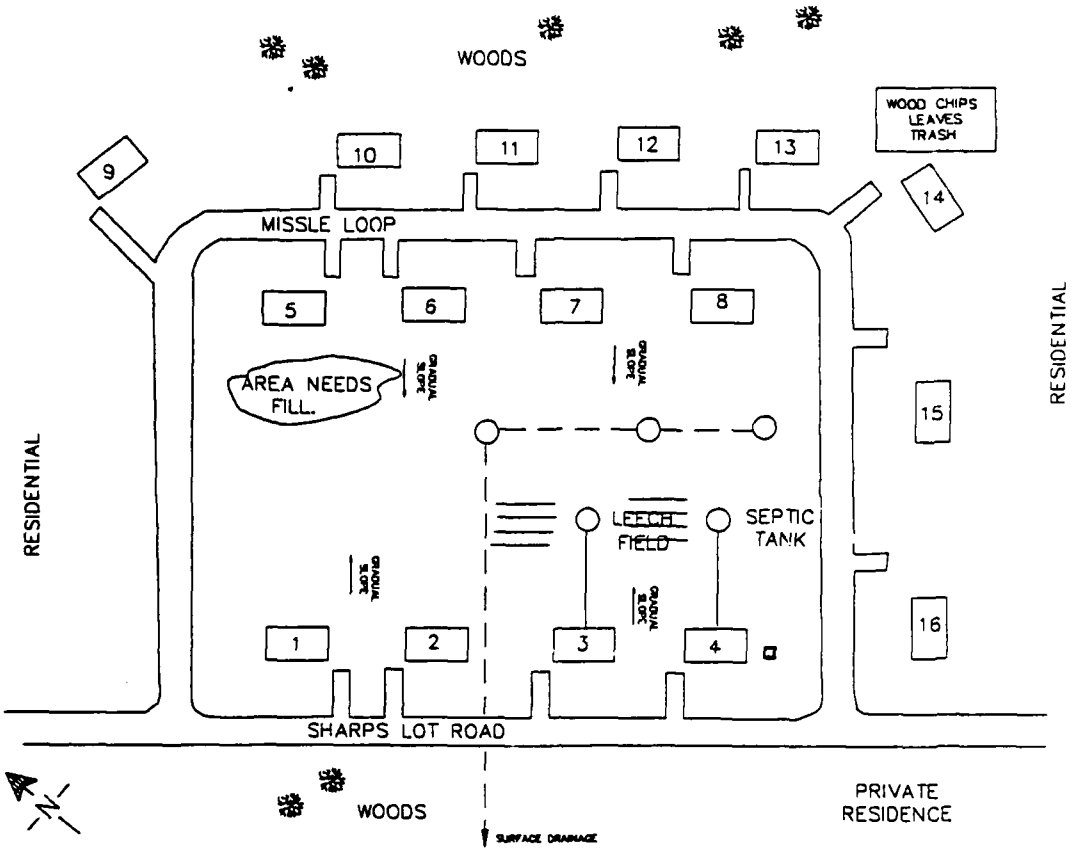

FIGURE 3 Site Plan Map of Swansea Army Housing Units

2.3 PROPERTY HISTORY

2.3.1 Nike Defense Program and Typical Battery-Level Practices

Generic information on the national Nike antiaircraft defense program has been compiled in two studies, one commissioned by the Army Corps of Engineers[7] and the other by the U.S. Army Toxic and Hazardous Materials Agency.[8] In both studies, independent contractors relied on information contained in unclassified documents related to the Nike surface-to-air missile program, including engineering drawings and specifications (for the facilities and the missiles themselves), interviews with Army personnel participating in the Nike program, and operations manuals and directives relating to the operations and maintenance of Nike facilities. Taken together, these two reports represent the most complete assemblage of generic information on the Nike missile program from an environmental perspective. Salient points from both reports are condensed below.

At its zenith in the early 1960s, the Nike program included 291 batteries located throughout the continental United States. The program was completely phased out by 1976, with many of the properties sold to private concerns or excessed to state or local governments for nominal fees.

Nike Ajax missiles were first deployed in 1954 at installations throughout the continental United States, replacing, or in some cases augmenting, conventional artillery batteries and providing protection from aerial attack for strategic resources and population centers. Typically, Nike batteries were located in rural areas encircling the protected area. The Ajax was a two-stage missile using a solid-fuel booster rocket and a liquid-fuel sustainer motor to deliver a warhead to airborne targets.

The Ajax missile was gradually replaced by the Nike Hercules missile, introduced in 1958. Like the Ajax, the Hercules was a two-stage missile, but it differed from the Ajax in that its second stage was a solid-fuel rather than liquid-fuel power source and its payload often was a nuclear rather than conventional warhead. Ajax-to-Hercules conversions occurred between 1958 and 1961 and required little change in existing Nike battery facilities. A third-generation Nike missile, the Zeus, was phased out during development and consequently never deployed.

A typical Nike missile battery consisted of two distinct and separate operating units, the launch operations and the integrated fire control (IFC) operations. The two operating areas were separated by distances of less than two miles, with lines of sight between them for communications purposes. A third separate area was also sometimes part of the battery. This area was typically equidistant from the two battery operating sites and contained housing for married personnel assigned to the battery. Occasionally, these housing areas also contained battalion headquarters, which were responsible for a number of Nike batteries.

Depending on area characteristics and convenience, the housing areas were often reliant on the launch or IFC sites for utilities such as potable water, electrical power, and sewage treatment. In those instances, buried utility lines connected the housing area to one or both of the other battery properties. It is also possible, however, that housing areas were completely independent of the missile-launch and target-tracking operations. In those instances, the necessary utilities were either maintained on the housing site or purchased from the local community. In many localities, as the character of the land area around the housing units changed from rural to suburban or urban, communities extended utility services to the housing unit locations, in which case conversions from independent systems to community systems were made.

A large variety of wastes was associated with the operation and maintenance of Nike missile batteries. Normally encountered wastes included benzene, carbon tetrachloride, chromium and lead (contained in paints and protective coatings), petroleum hydrocarbons, perchloroethylene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethylene. Because of the rural locations of these batteries, and also because very few regulatory controls existed at that time, most of these wastes were managed "on-site." (Unused rocket propellants and explosives, however, would always have been returned to central supply depots and not disposed of on-site.) It is further conceivable that wastes generated at one of the Nike properties may have been transferred to its companion property for management or disposal.

Wastes related to missile operation and maintenance would not have been purposely transferred from a battery operating area to a housing area with no facilities for waste management or disposal. In some instances, however, the sewage treatment

facilities for all Nike battery properties were located at the housing area; that possibility cannot be automatically ignored. Finally, where housing areas received various utilities from either of the operating areas, it is also possible that wastes disposed of on those other properties may have migrated to the housing area via the buried utility lines. And since decommissioning of the Nike batteries did not normally involve removal of buried utility or communication lines, any such contaminant migration is likely to have gone unnoticed.

2.3.2 Swansea Housing Units

The Swansea housing area was developed in 1958 as a stand-alone housing facility. Despite its affiliation with the Nike battery site, the Swansea housing area was independent of the Nike battery with respect to all utilities and services. Sixteen single-family houses were erected on the property. Other property improvements included the installation of 16 individual septic tanks and plumbing connecting these tanks to a central sewage leach field, located in the approximate center of the property.

Since the initial property development in 1958, no other permanent structures have been added. However, renovations have taken place. Smoke/heat detectors were installed in the units in December 1976, and unit bathrooms were renovated in March 1989.[4]

The site investigation revealed that vinyl siding was installed over the original asbestos siding of each house. The date of this action is not documented, but the action was confirmed by the Army Corps Engineers office in Waltham. It is assumed that the siding was added for cosmetic reasons and that the original siding was still in good condition and left in place. It was also determined that no insulation was present on the water pipes inside any of the houses and that floor tiles, which may contain asbestos, were all in good repair.

2.4 ENVIRONMENTAL SETTING AND SURROUNDING LAND USE

Swansea is an industrial suburb of Providence, R.I. Land parcels in the immediate vicinity of the housing area are in residential use. Wooded areas lie along the property's east and west borders and private residences beyond the north and south borders.[9] The Swansea housing area is plagued by a high water table and poorly drained soil. Although not in an identified floodplain, the area is subject to flooding.

2.5 GEOLOGIC AND HYDROLOGIC SETTING

Swansea is located in the Taunton River Basin of the Seaboard Lowland Section of the New England Physiographic Province. The topography of the area is typified by low, rounded hills rising out of the swampy lowland and by a number of lakes, ponds, and creeks. Lowlands range in elevation from sea-level to approximately 350 feet at the tops of many small rolling hills. Lowlands lack a clearly defined drainage pattern and are poorly drained.[10]

The Taunton River flows to Narragansett Bay at Fall River. The basin's drainage area of 528 square miles (mi^2) includes at least 50 mi^2 of swamps and about 23 mi^2 of lakes and ponds; more than 50 of the ponds have an area of at least 10 acres. Six of the seven ponds used for municipal water supply purposes are among the Lakeville Ponds, which, in 1967, furnished an average of 24 million gallons per day (mgd) to the cities of New Bedford and Taunton. Other ponds, swamps, and tributary stream valleys provide reservoir sites for impoundment of surface water. The largest potential source of surface water is the Taunton River, which, if upgraded in quality and treated, could furnish about 80 mgd from a reservoir in the estuary between Somerset and Freetown.

Streamflow from the basin during the period 1931-65 averaged about 230 billion gallons per year, or about 57% of the average annual precipitation. In the lower reaches of the Taunton River, aqueduct storage in swamps usually prevents or levels out peak flows; consequently, flooding is minor. However, in the upper reaches of the tributaries, where storage is relatively small, occasional damaging floods take place. Low flows are maintained by groundwater discharge. Less seasonal variation in streamflow is recorded in areas where streams traverse extensive deposits of sand and gravel than in areas underlain by till.

In 1967, the total water pumped from streams, lakes, and surface-water reservoirs was about 178 billion gallons. Of this amount, about 154 billion gallons of fresh and salt water were pumped from the Matfield and lower Taunton Rivers by electric utilities for cooling. An additional 12 billion gallons were pumped by municipal water systems to supply Brockton, Taunton, Attleboro, New Bedford, and several other municipalities; 10 billion gallons were diverted for agriculture; and about 2 billion gallons were used by industry. Exports from the basin exceeded its imports by approximately 7 billion gallons of water. Only a small part of the pumpage is consumed within the basin. Most of the pumpage diverted by municipalities and industries eventually returns to the hydrologic system as sewage or industrial effluent and consequently does not contribute substantially to the total draft on the system.

Mean annual temperature is about 50°F. Mean annual precipitation in the area is about 44 inches per year, of which 28 inches evaporates and transpires. Part of the remainder travels overland directly to streams and, during or immediately after storm periods, makes up a large part of the increased streamflow. However, most of the water not evaporated or transpired percolates through the ground to the water table and then moves to streams, where it becomes the major component of annual streamflow. Groundwater discharge may be as much as two-thirds of the average annual runoff and, in unregulated streams, is commonly the sole supply for streamflow during low-flow periods. The 1-year 24-hour rainfall is about 2.5 inches in this area.

Soils of the study area have formed since the retreat of the Wisconsin ice sheet.[11] Soil development reflects the influence of glaciation. Generally, the Paxton-Hollis-Canton and the Canton-Paxton-Merrimac soil associations have formed on the upland hills and ridges that are manteled with glacial till. The Hinckley-Windsor-Much association has formed on glacial outwash deposits and the Dune Land-Tidal Marsh-Beaches association has formed along the coast.

Unconsolidated glaciofluvial deposits of sand and gravel constitute the principal aquifers in the area. The crystalline bedrock aquifer beneath the unconsolidated deposits is of secondary importance.

The crystalline-bedrock aquifer consists primarily of igneous and metamorphic rocks, including the Dedham grano-diorite of Devonian age, the Pre-Cambrian Marlboro formation, and Carboniferous-age metamorphic rocks. The rocks have been folded, fractured, and faulted. Bedrock exhibits low porosity, specific yield, and hydraulic conductivity. Wells drilled in bedrock for domestic water supplies are commonly 100 to 300 feet deep and generally yield a few gallons per minute.

Of the total area mantled by unconsolidated deposits, approximately 25 square miles, including 90 different locations, is known to be underlain by permeable material that is capable of yielding 300 gallons per minute (gpm) or more to a single well. Groundwater in some of the 90 areas cannot be used, however, because of urbanization, proximity of potential sources of pollution, or economic reasons. Many of the 90 high-yielding parts of the principal aquifer system are located in thick, permeable stratified glacial drift, which fills depressions in the underlying surface of till and bedrock. Many of these depressions, which are formed in valleys of pre-glacial drainage system, have little similarity to the patterns of present-day drainage system. The unconsolidated deposits that fill these depressions are the major sources of the 3.1 billion gallons of groundwater pumped in 1967 by 21 cities, towns, and water districts, and for the 1.2 billion gallons pumped by industrial, institutional, domestic, and agricultural wells. The net amount of groundwater brought into the basin by municipalities in 1967 was about 0.15 billion gallons. Many domestic and industrial wells finished in bedrock produced about 0.2 billion gallons during 1967.[12]

Precipitation is the principal source of recharge to the groundwater aquifer. Direct infiltration of rain and snow melt into outcrops of outwash, ice-contact, and wetland deposits acts as the primary recharge mechanism; because of low hydraulic conductivity and steeper slopes, recharge through till and bedrock outcrops is minimal. Discharge of groundwater in the basin is mainly from well pumping, evapotranspiration, and seepage to ponds, springs, wetlands, and streams. Water-table levels are generally highest in the late winter and spring and lowest in the late summer and fall.

The water pumped from streams, reservoirs, and wells is generally soft, acid to slightly acid, and low in dissolved solids. Although the water meets standards for potable water in most respects, the concentrations of iron and manganese commonly exceed the limits recommended by the U.S. Public Health Service. Consequently, most streams require treatment before being acceptable as a public supply. Sediment and turbidity are low in most streams, except for brief periods during high flows.

Groundwater in the stratified drift commonly is corrosive and locally exceeds the limits for iron and manganese in public water supplies as recommended by U.S. Public Health Service. Water from wells in bedrock commonly contains an abundance of iron. Groundwater is used without treatment in some municipal systems; in many locations, however, the water is chlorinated or treated by other methods to correct for pH or to remove iron and manganese.

3 ENVIRONMENTALLY SIGNIFICANT OPERATIONS

3.1 SEPTIC SYSTEM PROBLEMS

Swansea has a history of drainage and sewage problems dating back to December 1968.[13] In April 1987, a period of heavy rainfall required pumping several of the individual septic tanks two to three times a day to provide limited sewage treatment. Raw sewage was backing up into the houses on a regular basis when the system overloaded, thus causing a dangerous health hazard.[14]

The specific drainage/flooding problem evidenced in 1987 involved sewage washing out of the leach field and mixing with stormwater runoff in a storm drain and ditch.[15] From the ditch, the contaminated water flowed off the installation through a culvert and to a wooded area across Sharps Lot Road. Two recommendations were made to deal with the situation: replacement of all plumbing fixtures with flow-limiting devices and removal of garbage disposals.[14] No records show that the recommendations were acted on. These measures would increase the retention time of waste in the septic tanks, while also reducing the amount of suspended solids entering the system. The measures were acknowledged as addressing only part of the long-term problem.

In a January 1988 investigation of the Swansea property by the New England Division of the Army Corps of Engineers, it was determined that most of the sewage-disposal leaching areas were installed below the water table. This situation allowed groundwater to infiltrate the system during periods of heavy rainfall, thus filling the septic tanks and preempting their effectiveness. Upon visual inspection of these septic tanks, it was evident that groundwater was seeping into the tanks.[16]

It was also determined that the leaching field was constructed in areas with poor surface drainage. A storm drainage system was installed to alleviate surface water problems; due to the close proximity of the drain line to the leaching field, however, raw sewage had infiltrated the storm drain and was carried to an open ditch in front of the houses.[16]

Generally, high groundwater is only part of the problem. Another aspect involves the septic tanks and pipes, which are more than 30 years old. As constructed, the sanitary systems do not comply with current state sanitary codes. The current state code calls for the bottom of a leaching system to be a minimum of 4 feet above the groundwater table. The Swansea system was constructed with inverts below or just above the existing groundwater table.[16] The area is poorly graded and thus allows for surface water to collect over the system when it rains.

A proposed solution involved construction of a new on-site disposal system serving fewer houses than now exist on the property. This plan would involve the demolition of 4-6 housing units and use of the cleared area as a common leaching facility.[16] Soil tests showed that a more permeable soil is deeper than the 5-foot level.[17] The status of the proposed improvements is unknown.

3.2 UNDERGROUND STORAGE TANKS

Each unit has a 275-gallon underground fuel tank in front of the house. The fill pipe is located in front of each house, and most areas around the pipe evidenced staining of the soils. Although no documentation was found to indicate failures or suspected leaks in any of these tanks, records manifest that the tanks date to the original construction and are thus more than 30 years old. Circumstantially then, potential environmental risk results from the continued use of these tanks.

4 KNOWN AND SUSPECTED RELEASES

Because of the nature of the facility, no major releases or impacts on the environment have occurred at Swansea. No hazardous wastes or hazardous materials are stored on site.

One area of concern, however, is the continual sewage problem at the Swansea property. The back-up of raw sewage in a poorly drained area results in a constant effort to pump out the septic tanks before the next rainfall, at expensive cost to the Army, and produces a health hazard for people living in the facilities. Since the area is not controlled, residents in the surrounding area may also be subject to this health hazard.

Environmentally, sewage overflowing the septic system eventually leaves the property through a culvert and ditch and is deposited in an undeveloped wooded area to the west of the facility. The ultimate effect on surface water receiving property run-off has not been identified.

Underground storage tanks, installed in 1958, are still in service. However, no leaks are suspected and none have been documented.

5 PRELIMINARY ASSESSMENT CONCLUSIONS

Although this property was originally developed as part of a Nike missile battery located in Swansea, Mass., no wastes associated with the operation or maintenance of the battery were ever delivered to or managed at this housing property. Furthermore, the housing facility was completely independent of the battery's launch and fire control operations with respect to water, sewer, and electrical utilities. No documentary evidence was found of utility connections between this housing site and the other properties comprising the Swansea Nike missile battery.

Despite its independence from Nike battery operations, this property has affected the environment. An issue of central concern is a failing septic system, which is more than 30 years old (installed at the time of original property development). The Swansea housing area is located on poorly drained topography. The poor drainage, coupled with an exhausted sewage system, has caused extensive problems with the individual septic tanks of two of the housing units and with the common leaching field centrally located on site. Raw sewage is recorded as having backed up into individual housing unit septic tanks and, through plumbing, into the housing units themselves, creating dangerous health hazards. In addition, in periods of heavy rainfall, groundwater infiltrates the septic system, resulting in untreated sewage being discharged to wooded properties surrounding the housing units.

Several options that address the sewage-treatment problem at Swansea have been identified, and some have been implemented over the last 20 years, but the problem still persists. Currently, the response to water infiltration has been to remove excess liquids from the affected individual septic tanks for off-site treatment. While adequate to address immediate problems, this response is neither cost-effective nor permanent.

Real property records do not indicate that asbestos-containing materials were used in any housing construction at this property. Since there was no access to the interior of the individual housing units, however, it is not possible to say whether asbestos-containing materials were introduced after initial construction.

Real property records also indicate that the original heating-oil tanks installed at each unit are still in service. Assuming an expected lifetime of approximately 20 to 25 years, these tanks can be considered as being at or near the end of their useful life. Furthermore, since none of these tanks has cathodic protection or other protective coatings, and since the topography of the property frequently results in saturated soil conditions, it can be assumed that the tanks have a high probability of leakage. Since integrity testing has never been performed on any of the tanks, conclusive statements regarding releases of stored product from any of them are not possible. It should be noted that wholesale contamination of the subsurface would very likely have been observed during the periodic overflow of the septic tank system, but no such contamination has been observed. Nevertheless, the possibility of releases from any of these tanks cannot, at this time, be completely ruled out.

6 RECOMMENDATIONS

The Swansea housing facility represents no imminent or substantial threat to human health or the environment. There is no evidence to suggest that hazardous or toxic constituents have ever been released from this property. No immediate remedial actions, therefore, are warranted for the site. Nevertheless, two environmental impacts at this property have been identified, and these warrant some ultimate remedial action.

The malfunctioning sewage-treatment system represents a continuing potential for environmental impact and an impediment to the expeditious excessing of this property. It is therefore recommended that a permanent solution to the sewage-treatment problem be developed and implemented. The septic tank failure at housing units #4 and #9, in particular, is an ongoing inconvenience and potential health hazard. The untreated sewage being discharged during periods of heavy rainfall, to the surrounding woodlands, creates an environmental risk as well.

Because the original heating-oil tanks are still in place underground at this property, and are assumed to be near or at the end of their expected useful life, it is recommended that all underground tanks be removed and replaced with new tanks. It is also recommended that soil tests be taken in all portions of the tank excavations to identify any contamination that may be present.

The recommendations assume this property will most likely continue to be used for residential housing.

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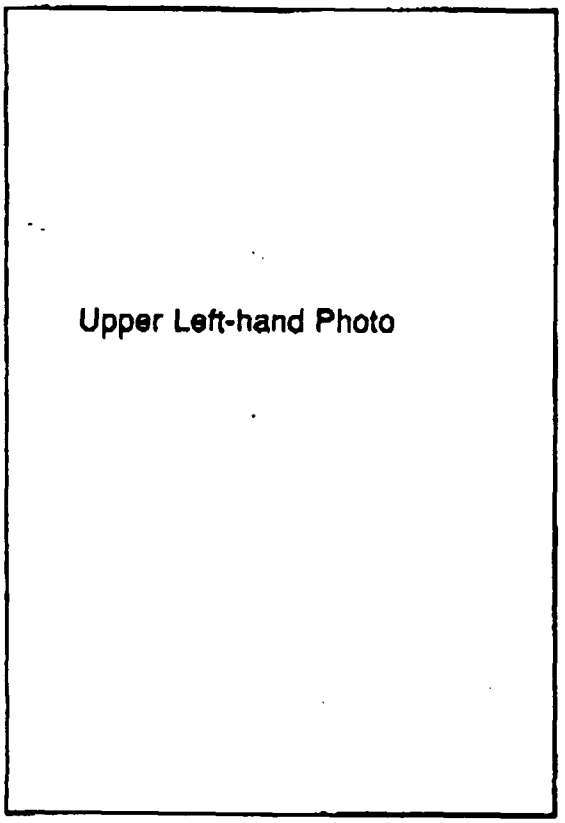
APPENDIX:

PHOTOGRAPHS OF SWANSEA HOUSING FACILITY AND SURROUNDING LAND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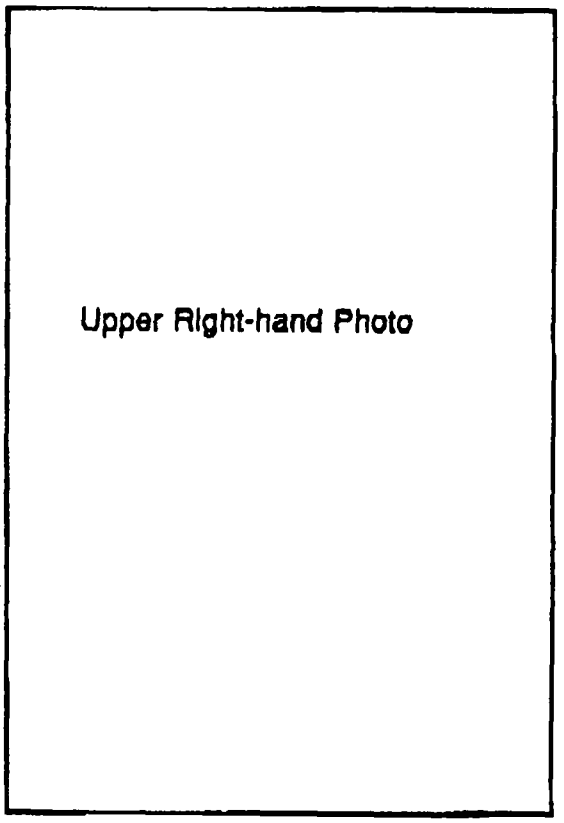
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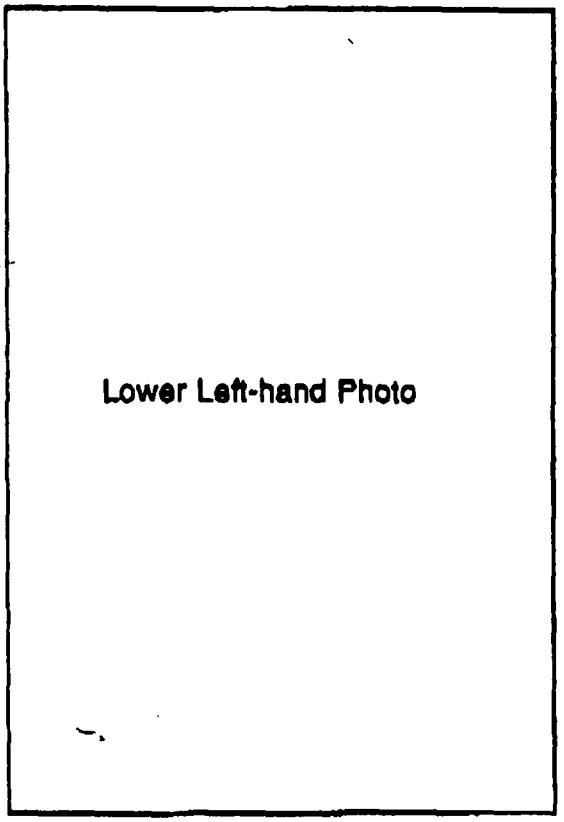
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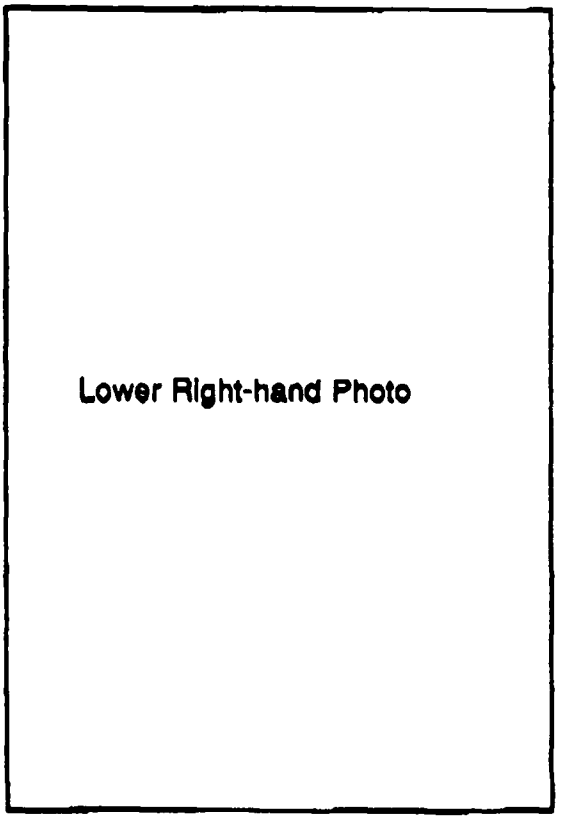
Lower Right-hand Photo

SWANSEA, MASSACHUSETTS

All photographs for this housing area were taken 5/18/89.)

Page 1:

Left photo: The common leachfield at the center of the housing area.

Right photo: Pathway of surface drainage across Sharps Lot Rd. and into the surrounding woodlands.

Page 2:

Upper left-hand photo: A typical Capehart-style house at the housing area, as well as the surrounding woodlands to the east.

Upper right-hand photo: View looking east from the housing area.

Lower left-hand photo: View of monitoring pipe in-ground, located on the north side of the housing area.

Lower right-hand photo: View of the depression where the common leachfield lies at the center of the housing area.

Page 3:

Upper left-hand photo: Location of an underground storage tank at the rear of a house.

Upper right-hand photo: House #9, which has been noted to have a history of septic problems.

Lower left-hand photo: Private residence to the north of the housing area, reportedly flooded by Army housing septic problems.

Lower right-hand photo: Fill pipe for an underground storage tank at the rear of a house.